



EPA Region 7 TMDL Review

TMDL ID: IA 04-LDM-02190-L
Document Name: EAST LAKE (OSCEOLA)

State: IA

Basin(s): DES MOINES RIVER
HUC(s): 07100008
Water body(ies): EAST LAKE OSCEOLA
Tributary(ies): WHITE BREAST CREEK HEADWATERS
Pollutant(s): ALGAE, PHOSPHORUS, TURBIDITY

Submittal Date: 3/21/2008

Approved: Yes

Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submittal letter was received by EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

A letter dated February 19, 2008, and received by EPA February 22, 2008, formally submitted this TMDL document for approval. Revised versions were submitted by e-mail attachments on March 21, 2008, and April 10, 2008.

Water Quality Standards Attainment

The water body's loading capacity (LC) for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

The LC is set through the use of a lake response model to target the annual amount of total phosphorus (TP) that East Lake (Osceola) can receive to meet its designated uses. To address the identified pollutants (algae and turbidity), the Carlson's Trophic State Indices (TSI) were used to link the concentration of TP to the quantity of algae and turbidity as measured by Secchi Depth (SD). A concentration of TP <72 ug/L, was set as a target to achieve TSIs for chlorophyll (algae) and Secchi depth (SD) (transparency) of <65; thereby meeting the desired Iowa's narrative WQS. These corresponding concentration values for TP and chlorophyll are 72 ug/L and 33 ug/L, respectively and the SD is equivalent to 0.7 meters (m). Using the BATHTUB model, estimates were developed for East Lake (Osceola), yielding a TP target concentration of 72 ug/L. The TMDL will result in a 319% reduction in TP loading.

The annual TP load to East Lake (Osceola) consists of external watershed loads, internal recycling loads and atmospheric direct deposition. The targeted TP LC for East Lake (Osceola) is 134 lbs/year and the daily load is 21.4 lbs/day, 88 lbs/year (19.3 lbs/day) externally from the watershed, 38.7 lbs/year (0.11 lbs/day) from internal recycling load, and 3 lbs/year from atmospheric direct deposition. The existing total average load from all sources is estimate to be 736 lbs/year. The estimate for the external watershed load is 308 lbs/year, for the internal recycling load is 425 lbs/year, and for the atmospheric direct deposition load is 3 lbs/year. The difference between the external and internal target and the existing loads are 220 and 382 lbs/year, respectively. Atmospheric direct deposition loads are considered constant. The LC for TP is set as a combination of reduction in internal and externally loaded phosphorus.

EPA concurs that meeting the TMDL targets will result in the attainment of WQS in East Lake (Osceola).

Numeric Target(s)

Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

The Iowa WQS (IAC 567-61) list the designated uses of East Lake (Osceola) as primary contact recreational use (Class A1) and aquatic life (Class B (LW)). In 2002, this impairment was changed to algae and turbidity, which are more descriptive of the problems identified at East Lake (Osceola). More recent assessments in 2004 revealed that the Class A1 designated use was assessed (monitored) as "not being supported" and Class B designated use was assessed as "partially supporting" due to the excessive water column nutrient loading, resuspension of sediment, and nuisance algal species (e.g., bluegreen algae) which contribute to a violation of the narrative criteria of aesthetically objectionable conditions.

For algae and turbidity the impairment is based on narrative standards which state that East Lake (Osceola) should be "free from materials attributable to wastewater discharges or agricultural practices producing objectionable color, odor, or other aesthetically objectionable conditions." The presence of objectionable algal blooms, limited clarity, and the presence of nuisance algal species are linked to TP loading through the use of Carlson's TSI. The phosphorous target was determined using the BATHTUB lake nutrient model. A numeric target of 72 ug/L of TP was developed to address the narrative standards using the surrogate measure of TSI; which links phosphorus concentrations to algal and turbidity conditions.

Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.

Carlson's TSI scores were used to define an established linkage between TP concentrations for the reduction of algae and turbidity. The linkage is indicated by a relationship between TP, chlorophyll and water SD (transparency) seen in a group of reference lakes. Phosphorus is the principal nutrient target because of blue-green algae's ability to fix atmospheric nitrogen and the overabundance of phosphorus inputs. The TP load to East Lake (Osceola) originates entirely from external watershed loads, internal recycling loads and a small amount of atmospheric direct deposition load on the lake surface. The watershed sources have been linked to the impairment using the GWLF/BasinSims model to estimate monthly and annual TP delivery. The internal and atmospheric direct deposition loads are linked by the BATHTUB lake nutrient model to nuisance algae.

By reducing the concentration of TP <72 ug/L, the TSIs for chlorophyll and SD should be reduced to <65 based on the relationships seen in this lake. A minimum in-lake reduction in TP to meet this goal is 319% which should result in a reduction of 109% for chlorophyll and an increase in SD (transparency) of 67%.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.

Only nonpoint sources influence the TP and sediment loading. There are no permitted point source discharges in the watershed. A significant source of phosphorus loading is internal recycling.

There are quantified phosphorus sources for East Lake (Osceola) in this TMDL. The first is the phosphorus load from the external watershed load areas draining into the lake. The second source is internal recycling phosphorus loads from the lake bottom sediments. The third source is atmospheric direct deposition. An

estimate of the watershed TP load was calculated in the GWLF/BasinSims model. An estimate of the internal recycling TP load was calculated in the BATHTUB model, as is the atmospheric direct deposition load. The internal recycling TP load is estimated to be more than half of the load to the lake. The external watershed and internal recycling loads are 308 and 425 lbs/year, respectively.

The critical condition for which the chlorophyll and SD TSI targets apply is the growing season, April through September. It is during this period that nuisance algal blooms are prevalent.

The only natural background condition is atmospheric direct deposition to the lake surface. Ground water is not a natural background condition since it originates as precipitation infiltration and land use has a strong influence on the pollutant load it carries. All known significant sources have been identified.

Allocation - Loading Capacity

Submittal identifies appropriate WLA for point, and load allocations for nonpoint sources. If no point sources are present the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2 (i)]. If this is a phase II TMDL the change in LC will be documented in this section.

The goal of this TMDL is to reduce TP loading to achieve an in-lake concentration of <72 ug/L resulting in TSI for SD and chlorophyll of <65. This will be accomplished with a TP LC of 134 lbs/year (21.52 lbs/day).

WLA Comment

Submittal lists individual WLAs for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.

There are no permitted point sources in the East Lake (Osceola) watershed. Therefore, the sum of the WLA is zero.

LA Comment

Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.

The TP LA for East Lake (Osceola) is the sum of the external watershed load, internal recycling load, and the atmospheric direct deposition load. Based on the BATHTUB lake nutrient modeling, the internal LA is 38.7 lbs/year (MOS applied) or (0.11 lbs/day), based on the GWLF/BasinSims model, the external LA is 88 lbs/year (MOS applied) or (19.3 lbs/day) and the atmospheric direct deposition load of 3 lbs/year (a constant 3 lbs/ 365 day = 0.01 lbs/day). The total LA for TP is 129.7 lbs/year.

EPA agrees this is an appropriate LA.

Margin of Safety

Submittal describes explicit and/or implicit MOS for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a phase II TMDL any differences in MOS will be documented in this section.

The MOS for TP is explicit for the internal recycling load allocation. For an estimated internal recycling TP load of 43 lbs/year, the internal MOS is 4.3 lbs/year. The internal LA after the MOS is applied is 38.7 lbs/year ($43 - [43 \times 0.1] = 38.7$ lbs/year) or 0.11 lbs/day.

The MOS for TP is implicit for the external watershed load based on conservative model assumptions and calculations. A 10% MOS was applied to estimate the allowable loads generated by the GWLF/BasinSims

model in the allocation spreadsheet (located in the TMDL).

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.

The TMDL for algae and turbidity was set for an annual loading of phosphorus that will result in meeting growing season targets (April through September).

Public Participation

Submittal describes required public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

A preliminary meeting with the Clarke County Conservation Board Executive Director, Anita Foland, was held on September 19, 2007, at East Lake Park. Iowa Department of Natural Resources (IDNR) staff toured the park and the watershed and obtained important information for the development of this report. The Clarke County Conservation Board owns and operates the park and lake.

The draft TMDL was available for public comment from January 17 through February 18, 2008. A public meeting was held on January 29, 2008, in Osceola to present and discuss the Draft TMDL for East Lake (Osceola). The meeting was attended by members of the Clarke County Conservation Board, the Director of the Clarke County Conservation Board, and the Natural Resources Conservation Service. No comments were received at these meetings as noted in IDNR's e-mail dated April 10, 2008.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].

Monitoring that will support analysis and modeling would need to include the following: Continuous measurement of flow through the lake discharge structure to accurately determine lake detention time, help calibrate the watershed model, and provide important data on how TP and chlorophyll respond to hydrologic conditions, biweekly sampling of important water quality variables that supports a mechanistic representation of the lake system and continuous measurement of flows from the lake's primary tributary and water quality sampling during rainfall events.

Monitoring to support the watershed improvement projects need to include the following: Areas that are now row crops could be represented as grassland in a watershed model to show how loads to East Lake (Osceola) might be reduced. Improve the lake sampling flow measurements that may permit the modeling evaluation of seasonal changes in algal productivity and the impact of precipitation.

Monitoring to support further understanding of the lake system needs the following: Watershed hydrology and East Lake (Osceola) response is better understood by a combination of continuous monitoring of inflow and outflow rates, dissolved oxygen, chlorophyll and phosphorus concentrations, temperature and turbidity. The variability in the lake systems from year to year is considerable and averaging available data over a few or many years will likely conceal important responses to changing hydrology and other factors. The internal loading can be controlled largely through the management of carp and other rough fish.

Reasonable Assurance

Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads.

There are no point sources in the watershed and reasonable assurances are therefore not required.